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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/059,173	01/31/2002	Dong Il Han	P-0336	6533
34610	7590	08/11/2004	EXAMINER	
FLESHNER & KIM, LLP P.O. BOX 221200 CHANTILLY, VA 20153			NATNAEL, PAULOS M	
			ART UNIT	PAPER NUMBER
			2614	

DATE MAILED: 08/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/059,173	<b>Applicant(s)</b> HAN ET AL.	
	<b>Examiner</b> Paulos M. Natnael	<b>Art Unit</b> 2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,8,10-13 and 19 is/are rejected.
- 7) ☒ Claim(s) 3-7,9,14-18 and 20 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>3/01/02</u> . | 6) <input type="checkbox"/> Other: ____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims **1,2, 8** are rejected under 35 U.S.C. 102(b) as being anticipated by Kim, U.S. Patent No. 5,943, 099.

Considering claim **1**, a motion-adaptive interpolation method comprising, receiving a continuous field data, estimating horizontal directional inter-frame motion information of a field to be currently interpolated and outputting the estimated motion information, calculating and outputting a line interpolation value by applying a rule and filtering according to the estimated motion information, is met by the I-P conversion device of fig.1;

Considering claim **2**, the method of claim 1, wherein the continuous field data includes two past field data, one current field data and one future field data, is met by disclosure in fig.3;

Considering claim **8**, the method of claim 1, further comprising the steps of:

Art Unit: 2614

receiving an input image signal, and storing and outputting a field data;  
receiving the field data, detecting and outputting an inter-field motion  
amount value and inter-frame motion amount value,  
improving a reliability of the detected motion and outputting a motion  
amount value, estimating an edge direction of a field image to be currently  
interpolated., is met by the correlator 130 illustrated in Figs.2B-2D. (see also col.  
4, lines 35-56)

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for  
all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described  
as set forth in section 102 of this title, if the differences between the subject matter sought to  
be patented and the prior art are such that the subject matter as a whole would have been  
obvious at the time the invention was made to a person having ordinary skill in the art to which  
said subject matter pertains. Patentability shall not be negated by the manner in which the  
invention was made.

4. Claims **10-13, 19** are rejected under 35 U.S.C. 103(a) as being  
unpatentable over Lim et al, U.S. Pat. No. 6,577,345.

Considering claim **10**,

a) a horizontal directional motion estimating means for receiving a  
continuous field data and setting a basic unit image region by estimating a

Art Unit: 2614

horizontal directional motion...and detecting a linear-interpolated pixel value by using the block matching error and outputting the detected pixel value, is met by motion compensated interpolation 100, fig.2;

b) a line interpolating means for receiving an output value from the horizontal directional motion estimating means and calculating a final interpolation value, is met by decision and combination circuit 600, fig.2; (note: the decision and combination circuit 600 receives the outputs of units 100, 200, and 300 which is an line-averaging interpolation (LAI) circuit).

Except for;

c) obtaining a block matching error (BME) by moving the basic unit image region at certain intervals in a horizontal direction of mutually opposite direction,.

Regarding c) , Lim et al. do not disclose BME. Lim et al., however, teach that "where pixels move upwardly or downwardly by a  $1/2$  pixel for a  $1/60$  second, that is, at the critical velocity (Velocity3), between successive fields, it is possible to bring only pixels, already interpolated, from the previous field  $F_{n-1}$  to the current field  $F_n$ , however, where such a situation, in which interpolated pixels are brought from the previous field to the current field, is repeated, an error propagation may occur because those pixels already interpolated in the previous field may involve an error." (col. 5, 10-20) Therefore, it would have been obvious to the skilled in the art at the time the invention was made to modify the system of Lim et al. by providing a mechanism such as the

Art Unit: 2614

BME for correcting error of pixel interpolation, so that the interpolation process would be performed efficiently and more accurately.

Considering claim **11**, the apparatus of claim 10, wherein the field data includes two past fields, one current field and one future field, is met by disclosure on Fig.1.

Considering claim **12**. The apparatus of claim 10, wherein the basic unit image region detects inter-frame motion information of the field data and estimates a horizontal directional motion from the motion information.

See rejection of claim 10 (a).

Considering claim **13**, the apparatus of claim 10, wherein the number of pixels of the basic unit image region is the number of vertical directional pixels x the number of horizontal directional pixels, wherein the number of the vertical directional pixels is 3 and the number of horizontal directional pixels are variably set by a user, is also met by disclosure on Fig.1.

Considering claim **19**. A motion-adaptive interpolation apparatus comprising:  
b) a motion detecting means for receiving the continuous field data from the field data providing means and detecting an inter-field and inter-frame motion, is met by motion-compensated interpolation(MCI) 100, fig.2;

Art Unit: 2614

c) a post-processing means for improving a reliability of the detected motion, is met by MCI side-effect check 400, fig. 2;

d) a horizontal directional motion estimating means for estimating a motion in a horizontal direction...and detecting a linear-interpolated pixel value, is also met by Motion compensation interpolation circuit 100 and as in the disclosure, "In accordance with the present invention, a deinterlacing process for a video is conducted using MCI where the video has a large part of complex and fine video region and is still or slow moving region in a horizontal direction."

e) an edge direction detecting means for receiving a field data and a horizontal line data from the field data providing means and detecting an edge direction, is met by edge directional interpolation (EDI) 200, fig.2;

f) a line interpolating means for receiving output information of the post-processing means, the horizontal directional motion estimating means and the edge direction detecting means, and obtaining a final interpolation value by using a rule and filtering in consideration of an influence of a block matching error value and a pixel value used for a temporal motion compensation, is met by decision and combination circuit 600, fig.2;

Except for;

a) a field data providing means for receiving an input image signal and storing and outputting field data.

Art Unit: 2614

g) obtaining a block matching error by moving a basic unit image region for a motion estimation at certain intervals in a different horizontal direction in order to perform a temporal compensation for a case that there is a motion in the direction,

Regarding a), Lim et al. does not specifically disclose storing means and source of the field data. However, it would have been obvious to the skilled in the art at the time the invention was made to modify the system of Lim et al. by providing a storage medium for the interlaced video signal that is provided from an outside unit and may be stored temporarily or permanently on the storage unit, in order to be retrieved and utilized conveniently any time the user/system desires to do so.

Regarding g), see rejection of claim 10 (c).

### ***Allowable Subject Matter***

5. Claims **3-7,9,14-18,20** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter: the claimed method, wherein the step of estimating horizontal directional motion information of a field comprises: receiving a continuous field data and setting a basic unit image region based on a pixel to be interpolated; obtaining a block matching error (BME) by moving the basic unit image region at



Art Unit: 2614

certain intervals in a horizontal direction of a mutually opposite direction; and, outputting a temporally linear-interpolated value according to a direction corresponding to a position of the pixel to be currently interpolated and pixel values of an adjacent field (a previous and a next pixels) used for the linear interpolation, by using the block matching error having a minimum value for each pixel to be interpolated, as in claim 3;

wherein the rule and filtering are performed in a manner that: in case of an accurate motion estimation, a temporal motion compensation is performed, in case of a vague motion estimation, a pixel value blended according to a temporal motion estimation and spatial edge direction estimation is used to be performed; and in case of an inaccurate motion estimation, a pixel value interpolated according to a spatial edge direction estimation is performed and a filtering is performed according to a slope of the estimated edge direction, as in claim 9;

wherein the linearly interpolated pixel value includes a temporally motion compensated interpolation value as the output of the horizontal directional motion estimating means, a temporal block matching error at that time, and previous and next pixel values used for the temporal motion compensation, as in claim 14;

a motion detecting means for receiving the continuous field data and detecting an inter-frame motion amount and an inter-field motion amount', a post-processing means for filtering the detected motion amount and outputting a precise motion amount value by extending the filtered signal; and an edge direction detecting means for receiving the continuous field data, estimating a direction of edges of the field image to be interpolated, and

Art Unit: 2614

performing an interpolation according to the direction, as in claim **15**;

wherein the data value inputted for the rule and filtering includes, a motion amount value obtained from the post-processing means; a pixel spatially positioned at a very upper and a very lower side of the pixel to be currently interpolated and pixels of a previous and next fields existing spatially at the same position as that of the pixel being currently interpolated, both obtained from the field data providing means; and spatial linear interpolation value according to the edge direction obtained from the edge direction detecting means, a spatial block matching error at that time, and pixels used for a spatial linear interpolation; and temporal motion compensated interpolation value obtained from the horizontal directional motion estimating means, a temporal block matching error at that time, and a pixel value used for a temporal motion compensation, as in claim **20**;

### ***Conclusion***

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

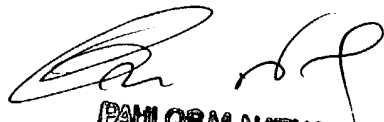
**Arita** et al. U.S. Patent No. **5,583,575** disclose image reproduction apparatus performing interfiled or interframe interpolation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paulos M. Natnael whose telephone number is (703) 305-0019. The examiner can normally be reached on 9:00am - 5:30pm.

Art Unit: 2614

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Miller can be reached on (703) 305-4795. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



PAULOS M. NATNAEL  
PATENT EXAMINER

PMN  
August 7, 2004